

# Construction Inspectors Safety Essentials



## The Survival Guide to Construction Site Safety

The Connecticut Department of Transportation



# Connecticut Department of Transportation Division of Occupational Health & Safety



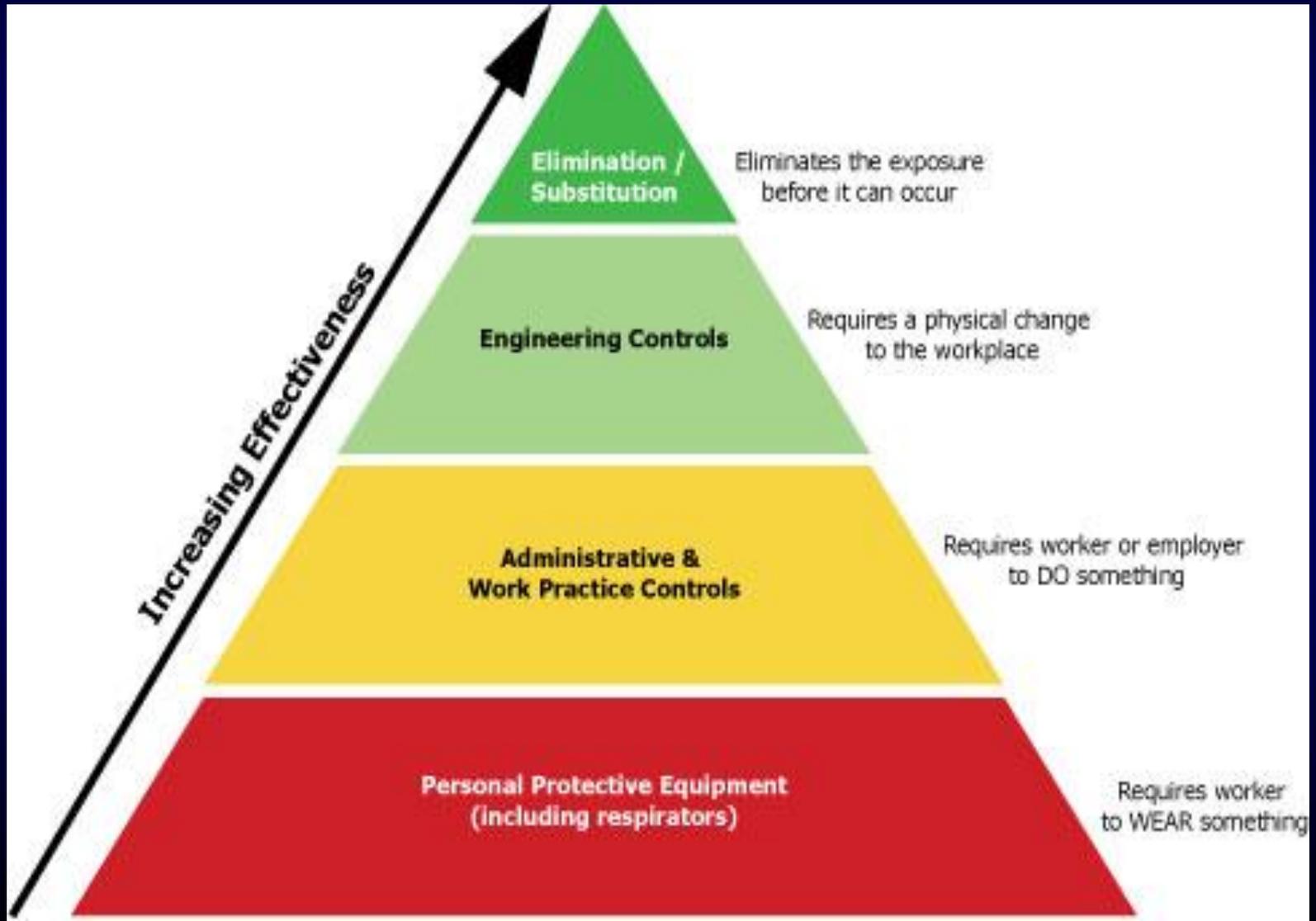
## Job Site Safety Reviews

James F. Ritter Director  
Division of Occupational Safety and Health  
The Connecticut Department of Transportation

# Construction Site Safety

- Pre-Con Safety Meeting
- Site Safety Checklist and follow up Report
- Visitors Guide
- JHA / THA Hazard recognition
- OSHA Hierarchy of Hazard Mitigation

# OSHA Hierarchy of Controls





# FATAL FOURS

OF THE CONSTRUCTION  
INDUSTRY

*Calendar Year 2013*

- Struck by - 82 (10.3%)
- Caught in between - 21 (2.6%)
- Electrocution – 71 (8.9%)
- Falls – 294 (36.9%) 294 out of 796 total deaths in the construction industry



**Go. / No Go!**



Worker



Access to scaffold is unacceptable, unprotected protruding steel, housekeeping,



**Unprotected protruding steel, Access to scaffold, scaffold walking surface, toe boards,**



**This scaffold was being used**



**Same job months later, new scaffold**



**Railings not adequately protecting employees from fall to river or excavation below.**



**This was being used as a bridge.**



Not a single rod was protected on this job.



09/21/2010 06:54

These slings could not pass the daily inspection but were used to sling this pump and hoses over the roadway with workers in close proximity.



More chains and unprotected rebar.



**Contractor told me they weren't using all the hooks. Is there a single good one?**



**Contractor had an entry plan for this confined space but nobody was following it. We had upwards of 6 DOT employees exposed to this hazard.**



**Benching, sloping, shoring, housekeeping, unprotected protruding steel, abandoned conduit and pipes not cut off or removed creating trip and impalement hazards.**



Site open to public, unprotected leading edge fall to lower level greater than 6'.



**View from top edge of site**





**Notice hole in fence at leading edge**



**Spoil piles on top of unstable ground.**



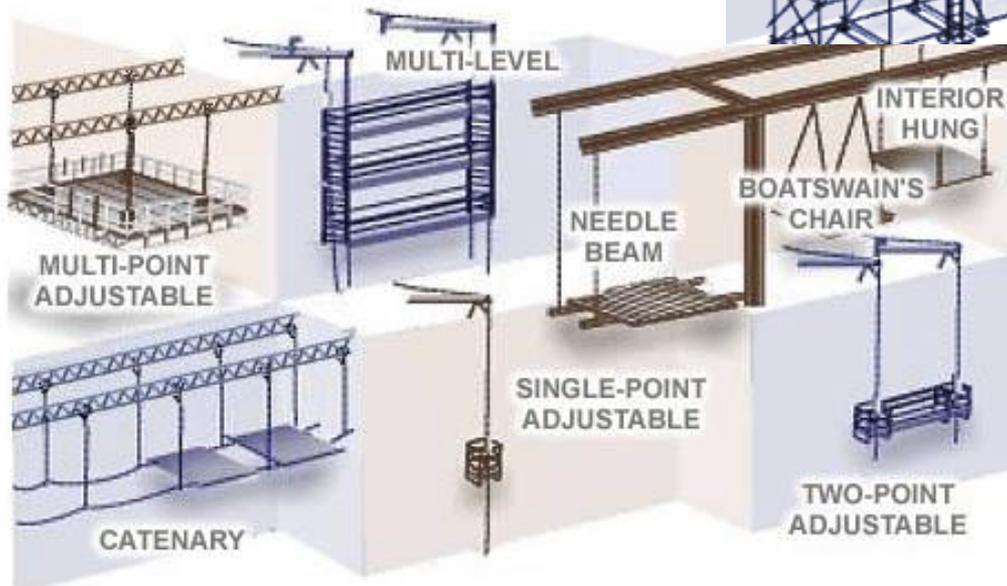
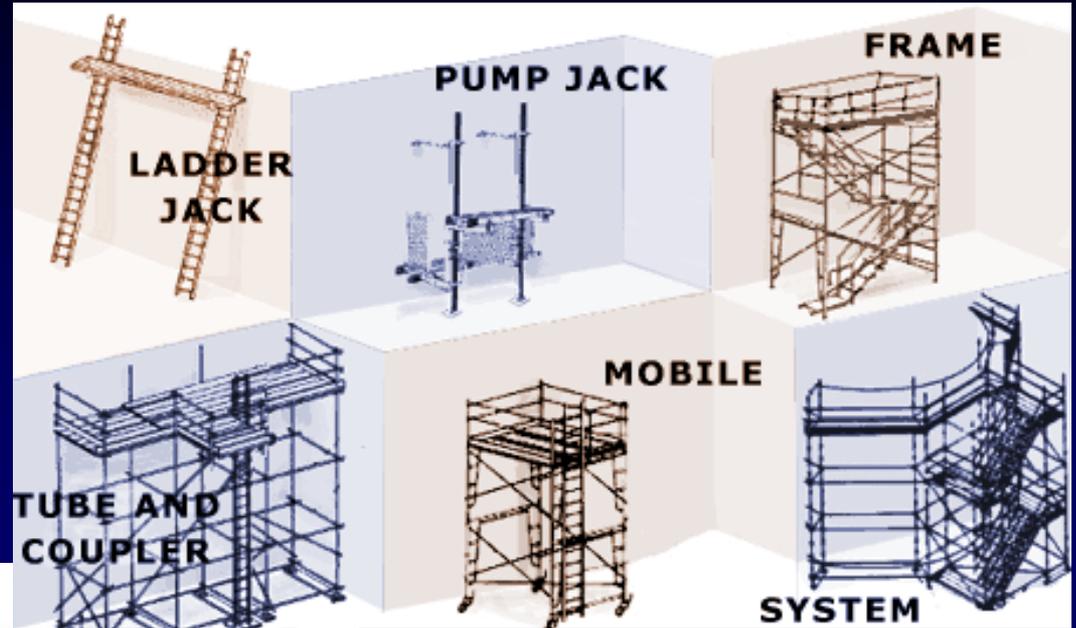


**Access to site, unstable soil, unprotected protruding steel, overhead storage, housekeeping**

# Personal Protective Equipment (PPE)

Department Policies

# Scaffolds

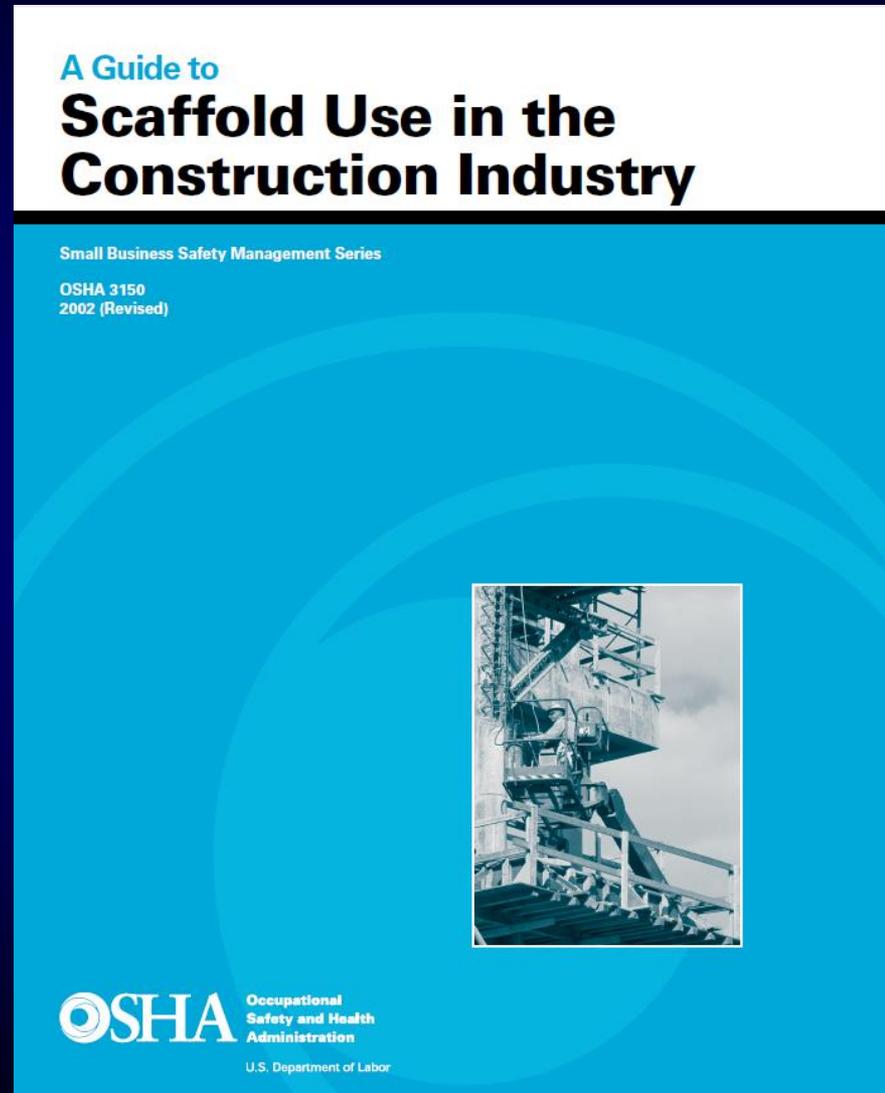


# OSHA Pub 3150

OSHA Publication 3150, A Guide to  
Scaffold Use in the Construction  
Industry:

[www.osha.gov/Publications/osha3150.pdf](http://www.osha.gov/Publications/osha3150.pdf)

f



# What Is A Scaffold?

Answer: An elevated, temporary work platform

Three basic types:

➤ **Supported scaffolds**

platforms supported by rigid, load bearing members, such as poles, legs, frames, & outriggers

➤ **Suspended scaffolds**

platforms suspended by ropes or other non-rigid, overhead support

➤ **Aerial Lifts**

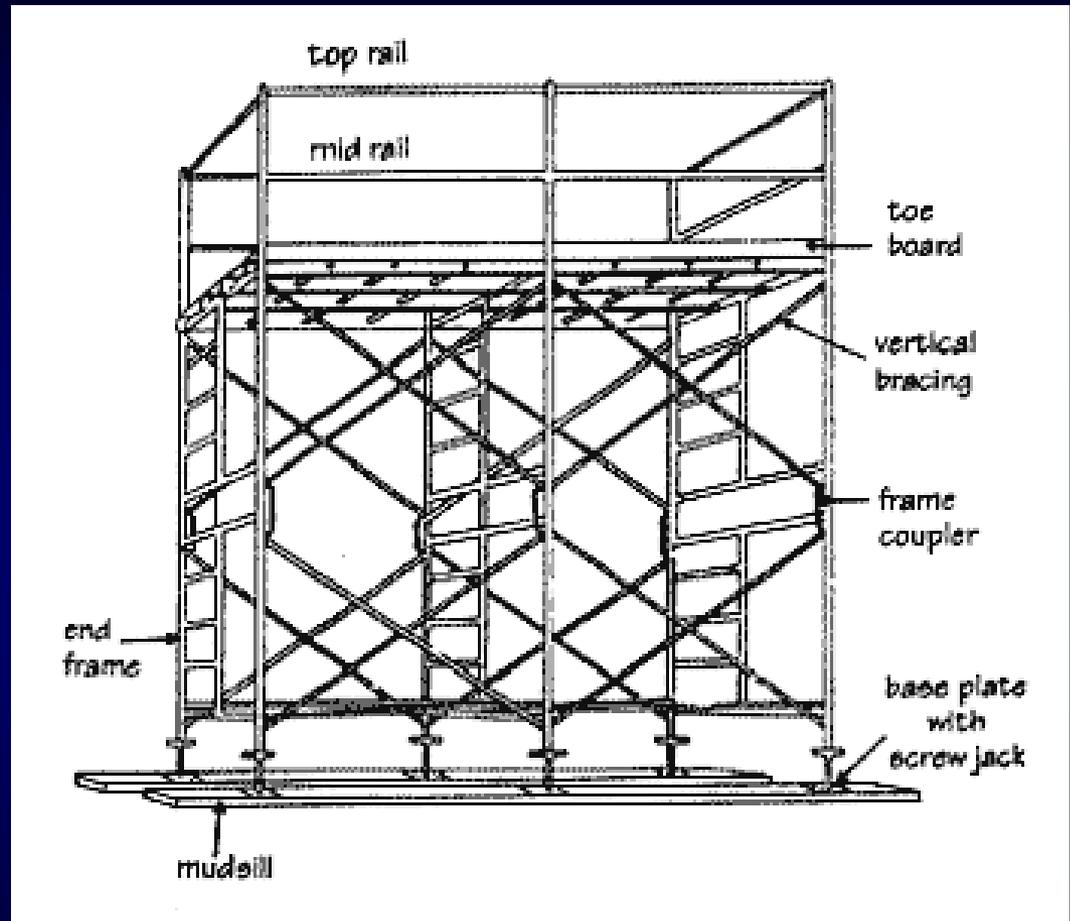
“cherry pickers” or “boom trucks”



# Scaffold Terminology

- Terminology:

- What is a platform?
- What is a brace?
- What is a stair tower?
- What is a bearer?
- What are mud sills and base plates?



# Hazards

Employees working on scaffolds are exposed to these hazards:

- **Falls from elevation** – caused by slipping, unsafe access, and the lack of fall protection
- **Struck by falling tools / debris**
- **Electrocution** – from overhead power lines
- **Scaffold collapse** - caused by instability or overloading
- **Bad planking** giving way



# Guardrails

Install along open sides & ends

Front edge of platforms not more than 14 inches from the work, unless using guardrails and/or PFAS

Top rails - 38 to 45 inches tall

Midrails halfway between toprail and platform

Toeboards at least 3-1/2 inches high



# Falling Object Protection

- Wear hardhats
- Barricade area below scaffold to forbid entry into that area
- Use panels or screens if material is stacked higher than the toeboard
- Build a canopy or erect a net below the scaffold that will contain or deflect falling objects



# Overhead Power Lines



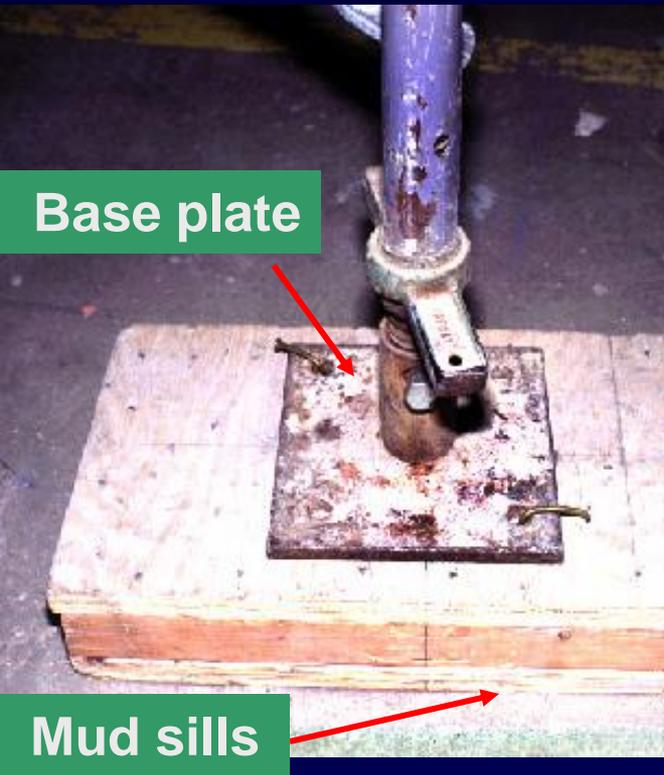
The possibility of electrocution is a serious consideration when working near overhead power lines

Check the clearance distances listed in the standard



Where you going to set up the scaffold?

# Scaffold Support Examples



**Good support**  
**GO**



**Inadequate support –  
in danger of collapse?**  
**No GO!**

# Essential Elements of Safe Scaffold Construction



Use appropriate scaffold construction methods

Proper scaffold access

Installation by a competent person

**Go**



**No Go!**

And yes this was a DOT construction project

# Scaffold Platform Construction

## Platforms must:

- be *fully planked* or decked with no more than 1 inch gaps
- be able to support its weight & 4 times maximum load
- be at least 18 inches wide



This is not a properly constructed scaffold

# Scaffold Platform Construction

- No large gaps in front edge of platforms
- Each abutted end of plank must rest on a separate support surface
- Overlap platforms at least 12 inches over supports, unless restrained to prevent movement



Planks not properly overlapped

# Platform Ends

Each end of a platform, unless cleated or otherwise restrained by hooks, must extend over its support by at least 6 inches

Less than 6"  
No Cleats



# Supported Scaffolds

Platforms supported by legs, outrigger beams, brackets, poles, uprights, posts, & frames

Restrain from tipping by guys, ties, or braces

Scaffold poles, legs, posts, frames, and uprights must be on base plates and mud sills or other firm foundation

**No Go!**



This support is not adequate!

# Proper Scaffold Access

**Provide access when scaffold platforms are more than 2 feet above or below a point of access**

**Permitted types of access:**

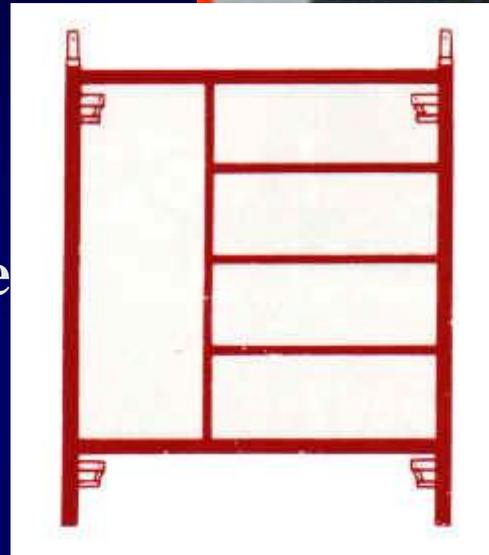
- ⦿ **Ladders, such as portable, hook-on, attachable, stairway type, and built-ins**
- ⦿ **Stair towers**
- ⦿ **Ramps and walkways**

**May use building stairs and come out window**



# Scaffold Access

- No access by crossbraces
- When using ladders, bottom rung no more than 24 inches high
- Can use some end frames
- Can access from another scaffold, structure or hoist



**End Frame**



# Don't use Shore or Lean-to Scaffolds

**Shore scaffold**  
supported scaffold  
which is placed  
against a building  
or structure and  
held in place with  
props



**Lean-to scaffold**  
supported scaffold  
which is kept erect  
by tilting it toward  
and resting it  
against a building  
or structure

# Fatal Fact – Ice & No Guardrails

Laborer was working on the third level of a tubular welded frame scaffold which was covered with ice and snow

The scaffold was not fully decked, there was no guardrail and no access ladder

The worker slipped and fell head first 20 feet to the pavement below



# Competent Person

**Person capable of identifying and promptly correcting hazards**

**Determines if it's safe to work on a scaffold during storms or high winds**

**Trains workers to recognize hazards**

**Selects qualified workers to conduct work**



# Scaffold Inspection

**Competent person  
inspects scaffolds for  
visible defects before  
each shift and after  
any alterations**

**Defective parts must be  
immediately repaired**





# Training Requirements

**Train employees on scaffold hazards and procedures to control the hazards**

**The training must include:**

- **Nature of electrical, fall, and falling object hazards**
- **How to deal with electrical hazards and fall protection systems**
- **Proper use of the scaffold**
- **Scaffold load capacities**

**Retrain as necessary**



# Avoid Hazards of Scaffolds

- Falls from elevation
- Bad planking
- Scaffold collapse
- Getting struck by falling tools or debris
- Electrocution



# Ladder Safety



# Introduction

You don't have to fall far to get hurt. Workers injured in falls from ladders are usually less than 10 feet above the ladder's base of support.



# Pre-Use Inspection

## Look For

- Cracks
- Splits
- Dents
- Bends
- Corrosion
- Missing Hardware



All of these ladders are unsafe and could fail if used by workers



# Construction Standard 1926

## **1926.1053(b)(15)**

Ladders shall be inspected by a competent person for visible defects on a periodic basis and after any occurrence that could affect their safe use.

## **1926.1053(b)(16)**

Portable ladders with structural defects, such as, but not limited to, broken or missing rungs, cleats, or steps, broken or split rails, corroded components, or other faulty or defective components, shall either be immediately marked in a manner that readily identifies them as defective, or be tagged with "Do Not Use" or similar language, and shall be withdrawn from service until repaired.

# Electrical Safety



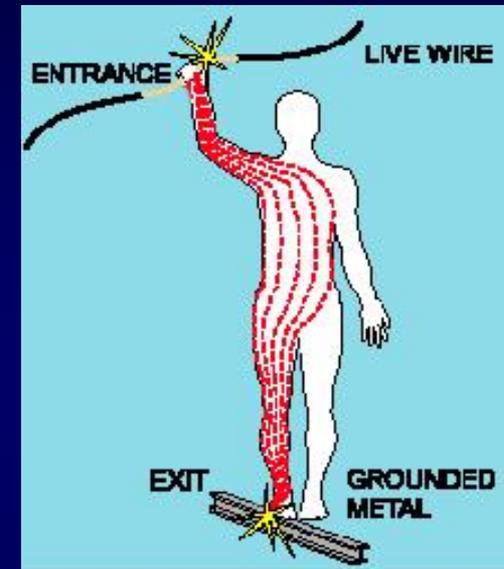
# Introduction

- An average of one worker is electrocuted on the job every day
- There are four main types of electrical injuries:
  - Electrocution (death due to electrical shock)
  - Electrical shock
  - Burns
  - Falls



# Electrical Shock

- Received when current passes through the body
- Severity of the shock depends on:
  - Path of current through the body
  - Amount of current flowing through the body
  - Length of time the body is in the circuit



***LOW VOLTAGE DOES NOT MEAN LOW HAZARD***

# Electrical Protective Devices

- These devices shut off electricity flow in the event of an overload or ground-fault in the circuit
- Include fuses, circuit breakers, and ground-fault circuit-interrupters (GFCI's)
- Fuses and circuit breakers are overcurrent devices
  - When there is too much current:
    - Fuses melt
    - Circuit breakers trip open

# Ground-Fault Circuit Interrupter

- These devices protect you from dangerous shock
- The GFCI detects a difference in current between the current carrying conductor and the neutral conductor wires (Black and White)

(When electrical equipment is not working correctly it causing current “leakage” – known as a *ground fault*.)

- If a ground fault is detected, the GFCI can shut off electricity flow in as little as 1/40 of a second, protecting you from a dangerous shock



# Grounding Path

- The path to ground from circuits, equipment, and enclosures must be permanent and continuous
- Violation shown here is an extension cord with a missing grounding prong



**Ground Removed!**

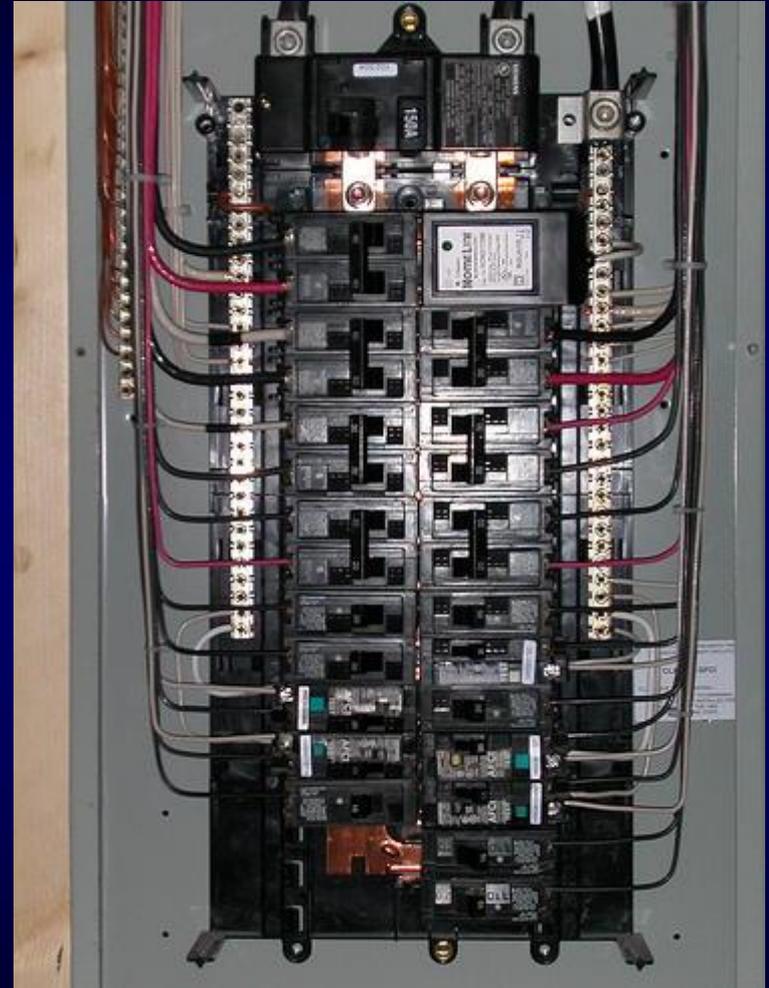
# Overhead Powerline Hazards

- Most people don't realize that overhead powerlines are usually not insulated
- Can you tell what the voltage is?
  - Open casket
  - Closed casket
- Be aware of powerlines within your work site. Ladders, dump trucks, excavators, pipe and conduit all conduct electricity.



# Guarding of Live Parts

- Live parts of electric equipment operating at 50 volts or more must be guarded against accidental contact.
- There are rare exceptions that allow electricians to work on live circuits.



# Use of Flexible Cords

- Use only three pronged cords protected by a GFI
- Flexible cords can be damaged by:
  - Aging
  - Running through holes in steel
  - Driving over them
- No flat cords on the job.
- Improper use of flexible cords can cause shocks, burns or fire



# Clues that Electrical Hazards Exist

- Tripped circuit breakers or blown fuses
- Warm tools, wires, cords, connections, or junction boxes
- GFCI that shuts off a circuit
- Worn or frayed insulation around wire or connection

# Cranes and Crane Safety

Elliot Henowitz -State Demolition and Crane  
Inspector

Office of State Fire Marshal

Bureau of License and Permits

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Hartford CT, 06106

Telephone (860) 713-5580

[Elliot.Henowitz@ct.gov](mailto:Elliot.Henowitz@ct.gov)

# Man Operated Unregistered Crane Without License, Police Say

The Hartford Courant, May 10, 2011

A man who police said was illegally using an unregistered crane at a construction site off I-95 was arrested Tuesday and charged with reckless endangerment. The Office of the State Fire Marshal was contacted about 1:30 p.m. about an illegal crane operation at the Milford Rest Area construction project site, state police said. A state crane inspector and a trooper from the fire marshal's office went to the site and determined Johnny Edwards, 54, was using the crane without a crane operator's license, according to police

# Man lift and Aerial lifts

## Aerial Lifts

### *DOT Inspector checklist*

You need to work from an aerial lift. How do you know if it's safe? What are the limitations? What are the questions you should ask? If you're not a certified operator then you need some help/guidance to determine is this a Go or No Go zone?

- ✓ Certification of hydraulic equipment. Man lifts like cranes are required to have an annual inspection. As a DOT employee you are required to ask for the registration/certification of inspection for the lift. Contractors providing these types of lifts know that they need to have this documentation with them and that they must produce it if asked. Once you have verified the inspection is current move on to the next item. See examples next page where to find an Annual Inspection certification on a man lift.
- ✓ Driver daily checklist. The operator of a Snooper style lift will also have a daily checklist documenting that he/she inspected the snooper that day. A man lift will not typically have this. Ask driver to provide documentation.
- ✓ Back-up plant. Is there a separate emergency power plant? Is it operating as designed? A man lift scissor lift will still allow you to lower the lift if the main power plant fails. Verify back-up system is working with operator.
- ✓ Conduct a visual inspection, walk around the equipment looking for
  - Leaks. With the equipment running do you see any visible leaks? A leak is defined as 1 drip per minute. Equipment that is leaking is a No Go.
  - "Spring Locks" and or other stabilizers. Are they working properly? Ask the driver/operator to show you that the stabilizers are working properly.
  - Turret bolts. Lug nuts, pins and clips. Look for loose or missing nuts, bolts, pins and clips. Did you see the operator inspecting this equipment?
  - Tires: Are the tires in good condition? Re-capped tires are not allowed on snooper type apparatus. There should be no cuts, bulges, exposed cord, or deteriorating sidewall "dry rot".

Lift Limitations: You should know the vehicles limitations such as maximum weight capacity, maximum wind speed for use, maximum operating slope, distance from electrical lines and other hazards. If you don't know, ask the operator.

# General Site Safety

- Air tools and hoses
- Blasting
- Pedestrians and ADA access
- Construction Equipment and Vehicles
- Material Handling; Ropes, chains and slings
- Working over water requirements
- OSHA Construction Digest

# Safety of others ADA

- [https://www.youtube.com/watch?feature=player\\_detailpage&v=HVk-fVqHY78](https://www.youtube.com/watch?feature=player_detailpage&v=HVk-fVqHY78)

# Confined Space Entry

## Awareness Training



# OSHA 1926.21(b)(6)(ii)

- Confined or enclosed space means any space having a limited means of egress, which is subject to the accumulation of toxic or flammable contaminants or has an oxygen deficient atmosphere. Confined or enclosed spaces include, but are not limited to, storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, pipelines, and open top spaces more than 4 feet in depth such as pits, tubs, vaults, and vessels.

# OSHA defines a Confined Space

A Confined Space means a space that:

- Is large enough, and so configured that, an employee can bodily enter and perform work; and
- Has limited or restricted means of entry or exit; and
- Is not designed for continuous human occupancy.

- OSHA 29CFR 1910.146(b)

# Permit-Required Confined Space

• A **Permit-Required Confined Space** is confined space that has **one or more** of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere;
- Contains a material that has the potential for engulfing an entrant;
- Has an internal configuration such that an entrant could become trapped or asphyxiated; or
- Contains any other serious safety or health hazard.

# Non-Permit Confined Space

- A confined space that does not contain or have the potential to contain any hazard capable of causing death or serious physical harm.





# Permit Required Confined Space



# Is this a confined space?



# Potential Hazards in Confined Spaces

- **Asphyxiating**

- **Oxygen Deficiency**

<19.5% or >23.5% oxygen concentration

- **CO<sub>2</sub>**

CO<sub>2</sub> is toxic in higher concentrations: 1% (10,000 ppm) will make some people feel drowsy.

Concentrations of 7% to 10% cause dizziness, headache, visual and hearing dysfunction, and unconsciousness within a few minutes to an hour.

- **Toxic Materials**

Carbon Monoxide

Hydrogen Sulphide

Welding fumes

Corrosives

- **Mechanical Hazards**

Mixers

Crushers

- **Engulfment**

Soil around an excavation

Water

Powdered material in a bin

# Oxygen Deficiency



- Can the oxygen be removed from a confined space?

- Are workers introducing a hazard by cutting, welding or some other way?

# IDLH

## IMMEDIATELY DANGEROUS TO LIFE OR HEALTH

- Any condition which poses an immediate threat to the health of life on an entrant, or;
- Would cause irreversible adverse health effects, or;
- Would interfere with an individual's ability to escape unaided from a permit space.

# ENTRANT

- The employee who will physically enter the confined space to perform the work.



# ATTENDANT

- The employee who remains outside the confined space and;
  - monitors the entrant(s)
  - guards the space against unauthorized entry
  - warns the entrants of any unusual conditions
  - and summons the rescue personnel if needed.



# ENTRY SUPERVISOR

- The employee responsible for coordinating the entry into the confined space.
- The supervisor can refer to anyone acting as the supervisor for the entry.



# Two Options for Entering Confined Spaces:

- Non-permit confined space entry
  - For non-hazardous confined space work
- Permit-required confined space entry
  - For hazardous or potentially hazardous confined space work

# Emergency Rescue

- Emergency rescue teams must be available while authorized entrants are in the permit confined space.
- Deaths often occur during rescue. Employees attempt to rescue an entrant without the proper training and then get caught themselves in the confined space.
- Only trained employees or designated resources such as Fire Departments are authorized to conduct confined space rescues.



# Personal Protective Equipment

- One of the most important components of PPE in a confined space is a respirator.
- Hearing protection may be required depending on the type of work being performed.
- Hard Hats
- Safety Glasses
- Hearing Protection
- Special clothing
- Gloves
- Safety shoes



# Bottom Line

- **Know what a confined space is and whether it is Non or Permit required. The space must be identified.**
- **Know that you need to be trained and authorized to enter.**
- **Know that you need to be trained to the specific hazard and how to reduce risk of exposure to the hazards.**
- **Know what PPE is required and when and how to use it.**
- **Know you need to either self rescue or that means of rescue are provided for by trained personnel or a rescue service.**

ADA



# Trenching and Excavation

# Dangers of Trenching and Excavation

***Cave-ins*** pose the greatest risk and are much more likely than other excavation-related accidents to result in worker fatalities.

Other potential hazards include falls, falling loads, hazardous atmospheres, and incidents involving mobile equipment.

**One cubic yard** of soil can weigh as much as a car.

An unprotected trench is an early grave. Do not enter an unprotected trench.

# Trench Safety Measures

- Trenches 5 feet (1.5 meters) deep or greater require a protective system.
- Trenches 20 feet (6.1 meters) deep or greater require that **the protective system be designed by a registered professional engineer** or be based on tabulated data prepared and/or approved by a registered professional engineer in accordance with 1926.652(b) and (c).

# Competent Person

- OSHA standards require that employers inspect trenches daily and as conditions change by a competent person before worker entry to ensure elimination of excavation hazards.
- **Definition:** A competent person is an individual who is capable of identifying existing and predictable hazards or working conditions that are hazardous, unsanitary, or dangerous to workers, soil types and protective systems required, and who is authorized to take prompt corrective measures to eliminate these hazards and conditions.

# Access and Egress

OSHA standards require safe access and egress to all excavations.

- Ladders, steps, ramps, or other safe means of access when working in an excavations 4 feet or deeper.
- They must be located within 25 feet of all workers.

# General Trenching and Excavation Rules

- Keep heavy equipment away from trench edges.
- Identify other sources that might affect trench stability.
- Keep excavated soil (spoils) and other materials at least 2 feet (0.6 meters) from trench edges.
- Know where underground utilities are located before digging.
- Test for atmospheric hazards such as low oxygen, hazardous fumes and toxic gases when  $> 4$  feet deep.
- Inspect trenches at the start of each shift.
- Inspect trenches following a rainstorm or other water intrusion.
- Do not work under suspended or raised loads and materials.
- Ensure that personnel wear high visibility or other suitable clothing when exposed to vehicular traffic.

January 14<sup>th</sup> 2015



**Construction Worker Hurt When Excavator Tips in Meriden**  
Photo Meriden Fire



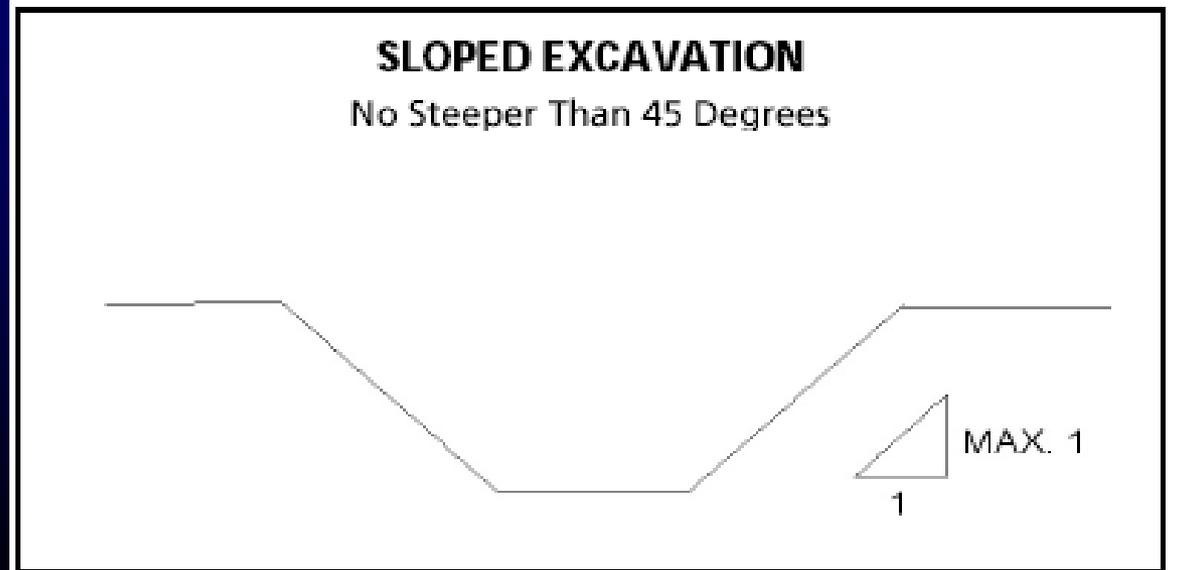
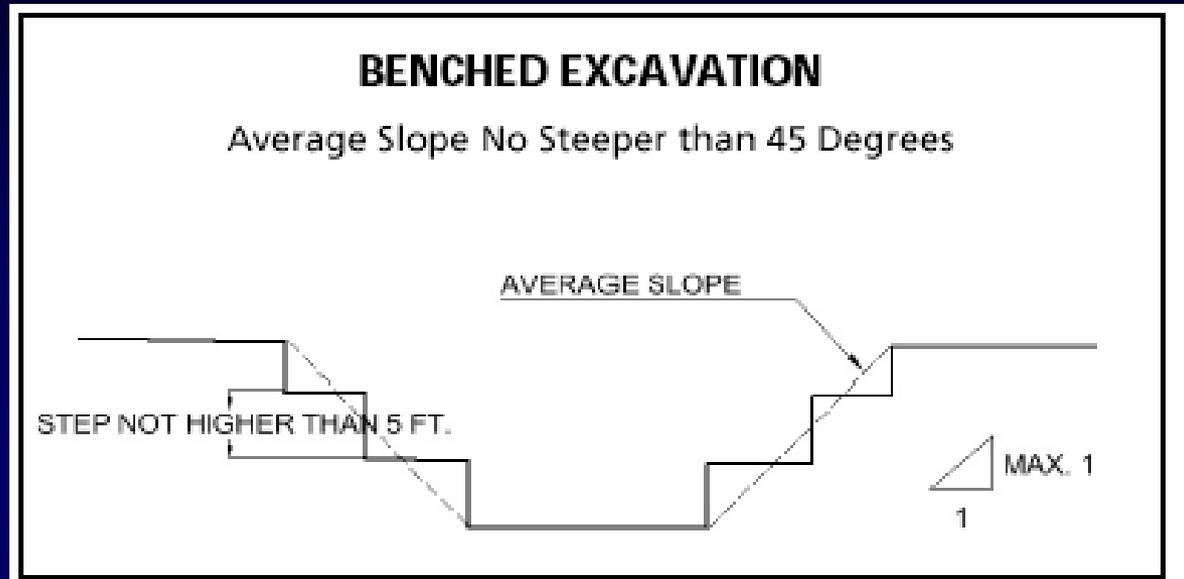




Was this you?

# Benching / Sloping

- Benching
- Sloping

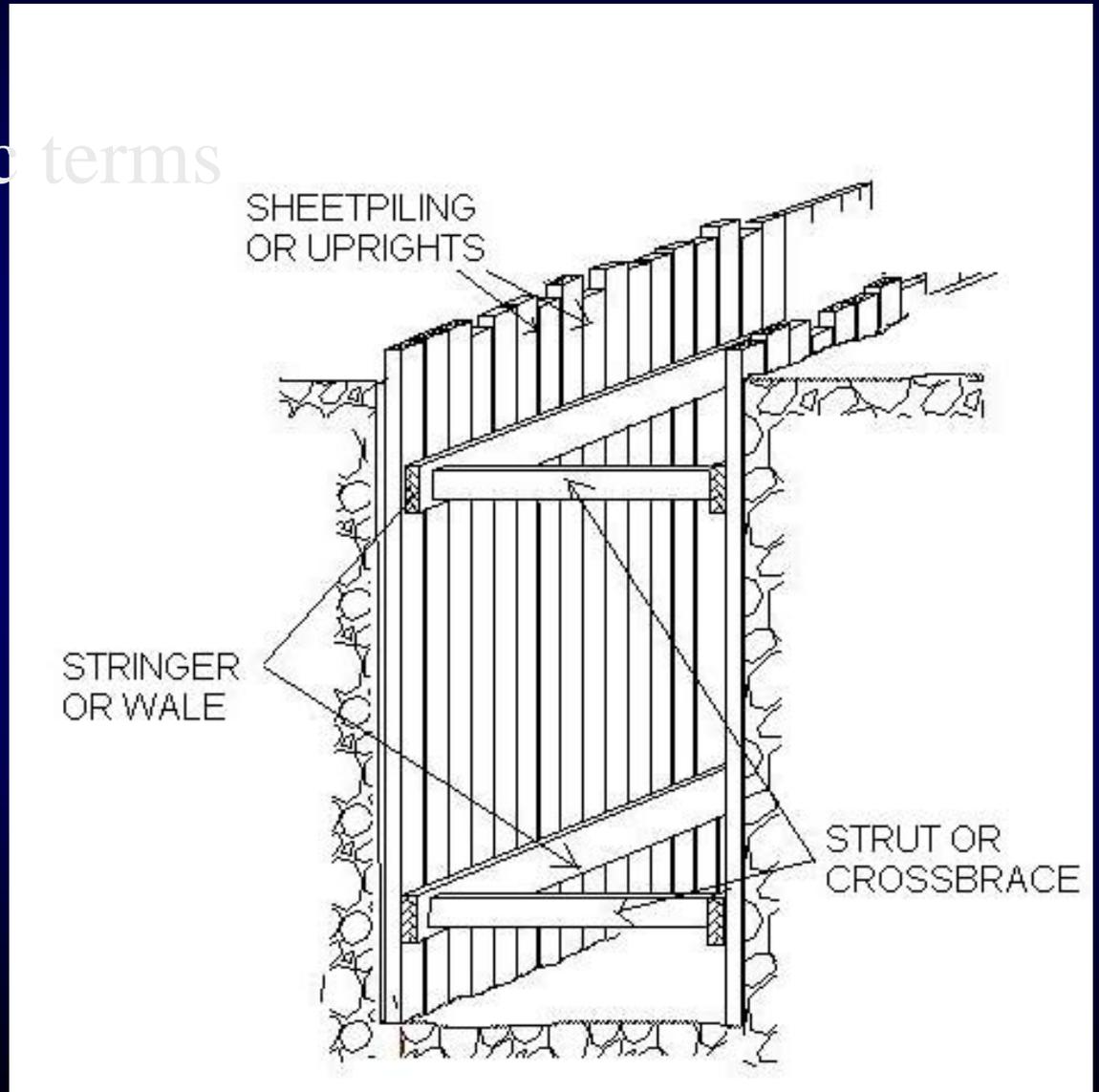


# Protective Systems

- **Shoring:** requires installing aluminum hydraulic or other types of supports to prevent soil movement and cave-ins.
- **Shielding:** protects workers by using trench boxes or other types of supports to prevent soil cave-ins. Designing a protective system can be complex because you must consider many factors: soil classification, depth of cut, water content of soil, changes caused by weather or climate, surcharge loads (e.g., spoil, other materials to be used in the trench) and other operations in the vicinity.

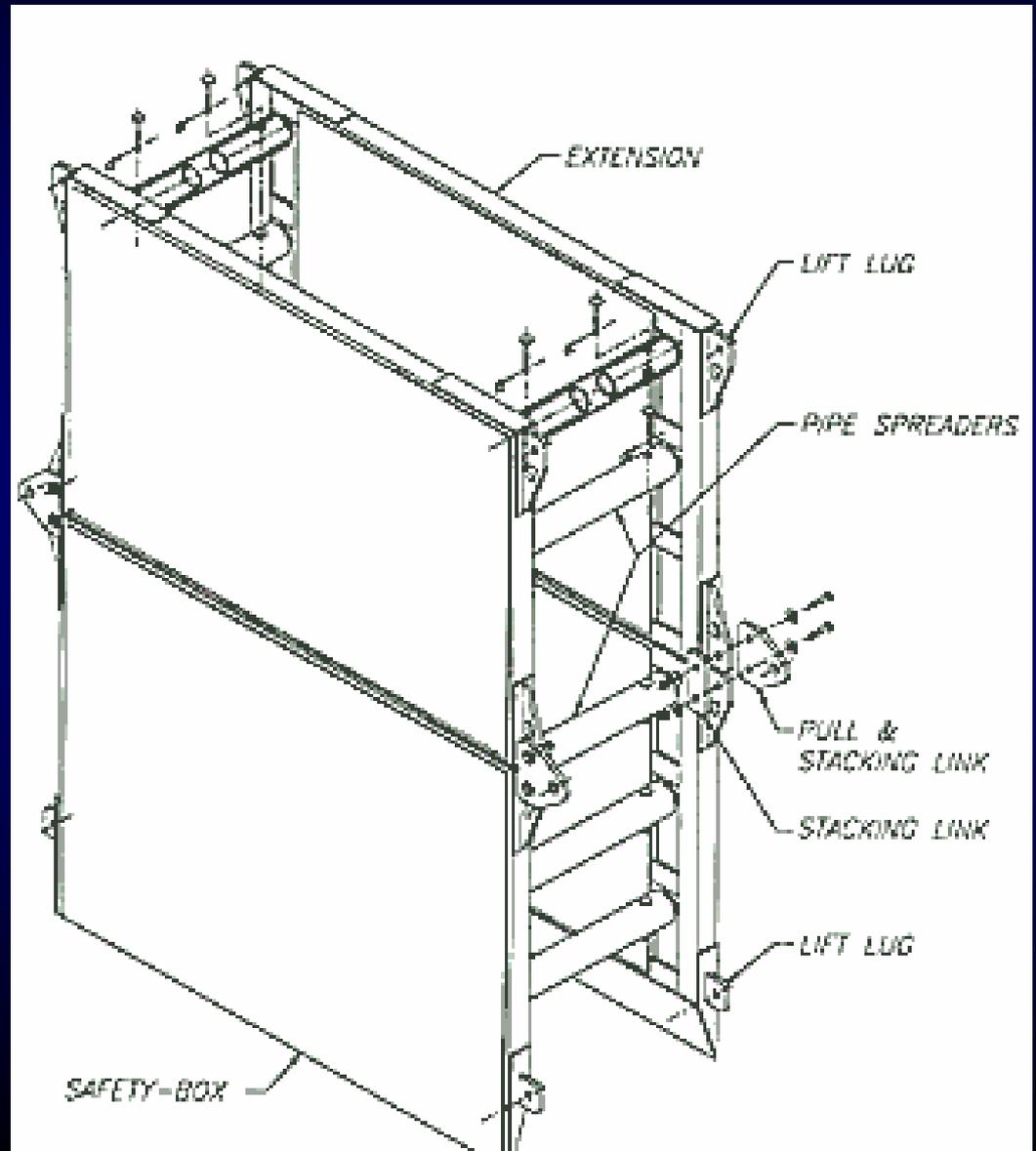
# Protective Systems

- Shoring: Basic terms



# Protective Systems

- Shielding:  
A “Trench box”



# HAZCOM

New label elements  
and safety data sheet (SDS)

# What is Hazard Communication (HAZCOM)?

The Hazard Communication Standard, also known as the Right-to-Know Law and more commonly as HAZCOM, is a federal regulation designed to protect workers from hazardous chemicals in the workplace. The goal of HAZCOM is to help employers and employees recognize dangerous materials in their work environment and the hazards these materials present.

# HAZARD COMMUNICATION: UPCOMING CHANGES

**Due to regulatory changes, on or before June 1, 2015:  
Material Safety Data Sheets (MSDS) will become  
Safety Data Sheets (SDS)**

- **SDS serve the same purpose as MSDS**
- **SDS will be in a uniform format and easier to read**
  - **Labels on hazardous chemicals will include:**
    - **Pictograms which visually identify the main hazards**
    - **Signal words: “warning” (less serious risk) or “danger” (more serious risk)**
    - **Hazard statements (what is the hazard?)**
    - **Precautionary statements (what should you do to protect yourself from the hazard?)**

# Pictograms

Pictograms are graphic symbols used to communicate specific information about the hazards of a chemical.

## GHS Pictograms



### CORROSION

- Skin Corrosion/Burns
- Eye Damage
- Corrosive to Metals



### EXCLAMATION MARK

- Irritant (skin and eye)
- Skin Sensitizer
- Acute Toxicity (harmful)
- Narcotic Effects
- Respiratory Tract Irritant
- Hazardous to Ozone Layer (Non-Mandatory)



### EXPLODING BOMB

- Explosives
- Self-Reactives
- Organic Peroxides



### SKULLS & CROSSBONES

- Acute Toxicity (fatal or toxic)



### FLAME

- Flammables
- Pyrophorics
- Self-Heating
- Emits Flammable Gas
- Self-Reactives
- Organic Peroxides



### GAS CYLINDER

- Gases Under Pressure



### ENVIRONMENT

- Acute Toxicity (fatal or toxic)



### HEALTH HAZARDS

- Carcinogen
- Mutagenicity
- Reproductive Toxicity
- Respiratory Sensitizer
- Target Organ Toxicity
- Aspiration Toxicity



### FLAME OVER CIRCLE

- Oxidizers

# New Label Format

## SAMPLE LABEL

CODE \_\_\_\_\_  
Product Name \_\_\_\_\_

**Product Identifier**

Company Name \_\_\_\_\_  
Street Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_  
Postal Code \_\_\_\_\_ Country \_\_\_\_\_  
Emergency Phone Number \_\_\_\_\_

**Supplier Identification**

### Hazard Pictograms



**Signal Word**  
**Danger**

Keep container tightly closed. Store in a cool, well-ventilated place that is locked.  
Keep away from heat/sparks/open flame. No smoking.  
Only use non-sparking tools.  
Use explosion-proof electrical equipment.  
Take precautionary measures against static discharge.  
Ground and bond container and receiving equipment.  
Do not breathe vapors.  
Wear protective gloves.  
Do not eat, drink or smoke when using this product.  
Wash hands thoroughly after handling.  
Dispose of in accordance with local, regional, national, international regulations as specified.

**In Case of Fire:** use dry chemical (BC) or Carbon Dioxide (CO<sub>2</sub>) fire extinguisher to extinguish.

#### First Aid

If exposed call Poison Center.  
If on skin (or hair): Take off immediately any contaminated clothing. Rinse skin with water.

**Precautionary Statements**

Highly flammable liquid and vapor.  
May cause liver and kidney damage.

**Hazard Statements**

### Supplemental Information

Directions for Use

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Fill weight: \_\_\_\_\_ Lot Number: \_\_\_\_\_  
Gross weight: \_\_\_\_\_ Fill Date: \_\_\_\_\_  
Expiration Date: \_\_\_\_\_

# Signal Word

The Signal Word (“**Warning**” or “**Danger**”) is determined by the level of risk for each chemical on each hazard.

# SDS (MSDS) WD40



# CONN -OSHA

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Connecticut Department of Labor

Occupational Safety Officer

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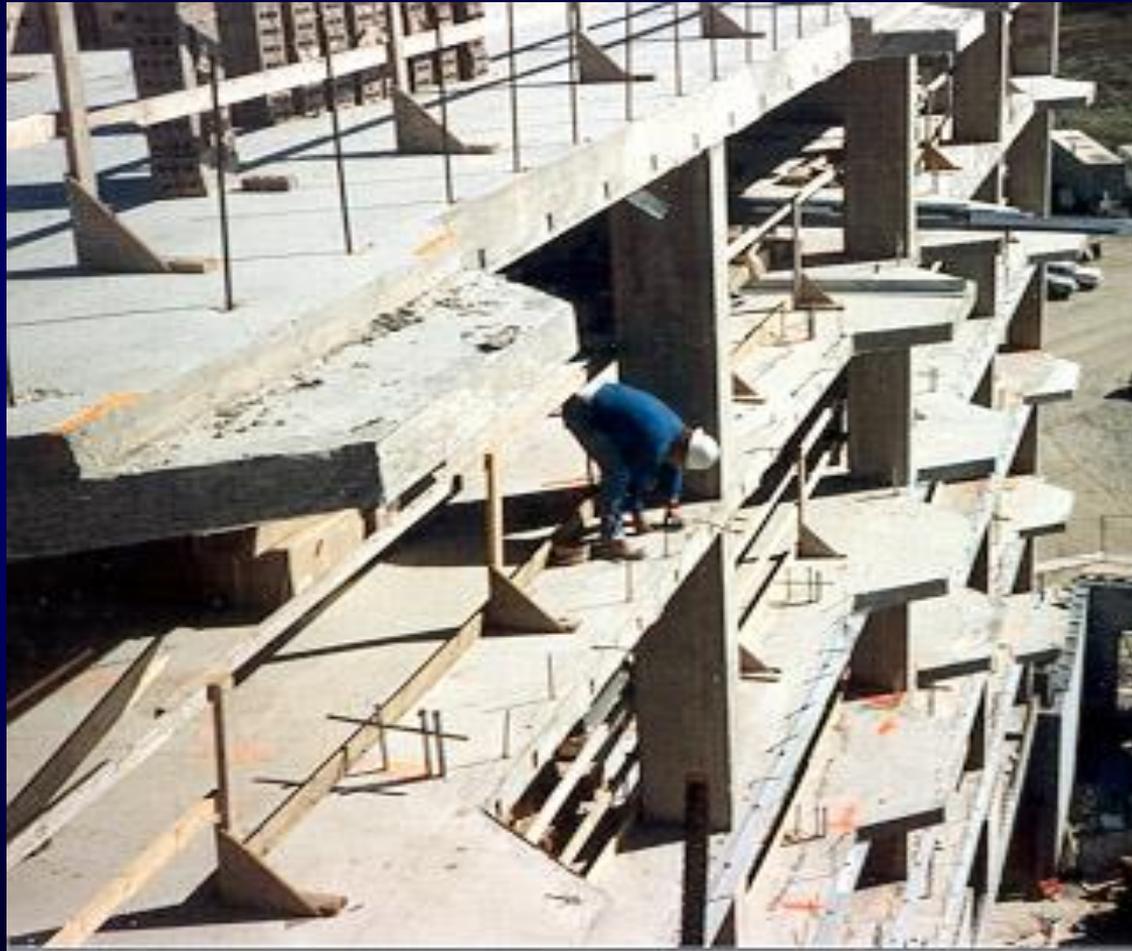


END of Day 1

Questions?

# Fall Protection

Identifying Fall Hazards and How to Minimize Exposure to Them



OSHA 1926 Subpart M – Fall Protection



# Falls in Construction

- Falls are the leading cause of deaths in the construction industry.
- Most fatalities occur when employees fall from open-sided floors and through floor openings.
- Falls from as little as 4 to 6 feet can cause serious lost-time accidents and sometimes death.



# 2013 OSHA's Top Ten Lists

<b>Standard</b>	<b>Citations Rank</b>	<b>Total Violations</b>
Fall Protection, Construction	1	8,241
Scaffolding, General Requirements, Construction	3	5,423
Ladders, Construction	7	3,311



# Components to Fall Protection

- Qualified Person
- Fall Protection Plan
- Competent Person
- Equipment



# Fall Protection Planning

Plan before work begins



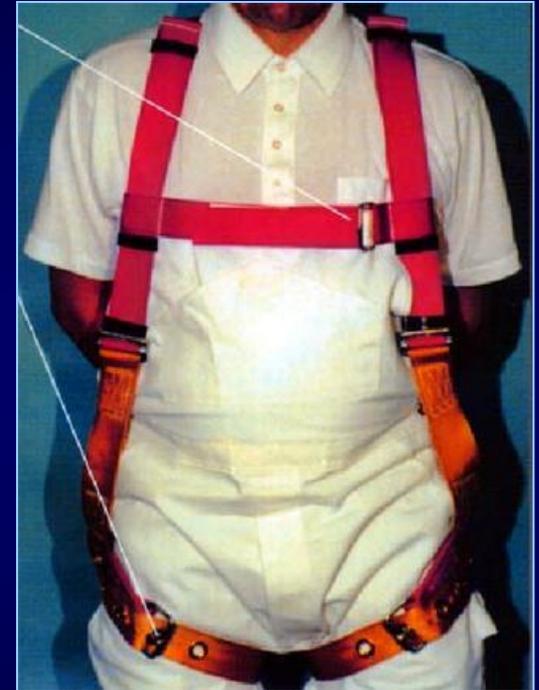
# Common Fall Protection Options



Guardrails



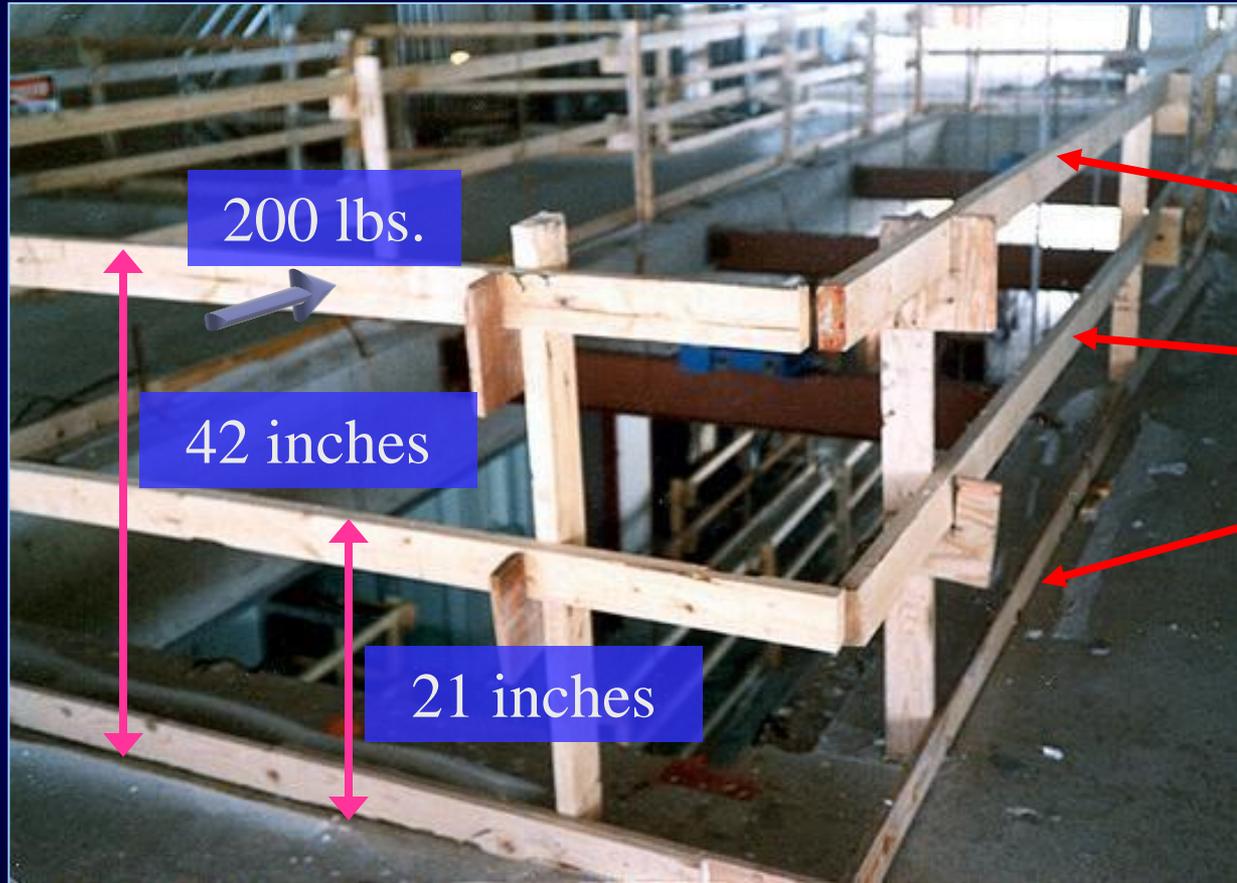
Safety Net



Personal Fall  
Arrest System  
(PFAS)



# Guardrails



Top Rail

Mid Rail

Toe Board



# Safety Nets



Close as practical to surface but no more than 30 feet  
below



# Personal Fall Arrest Systems (PFAS)

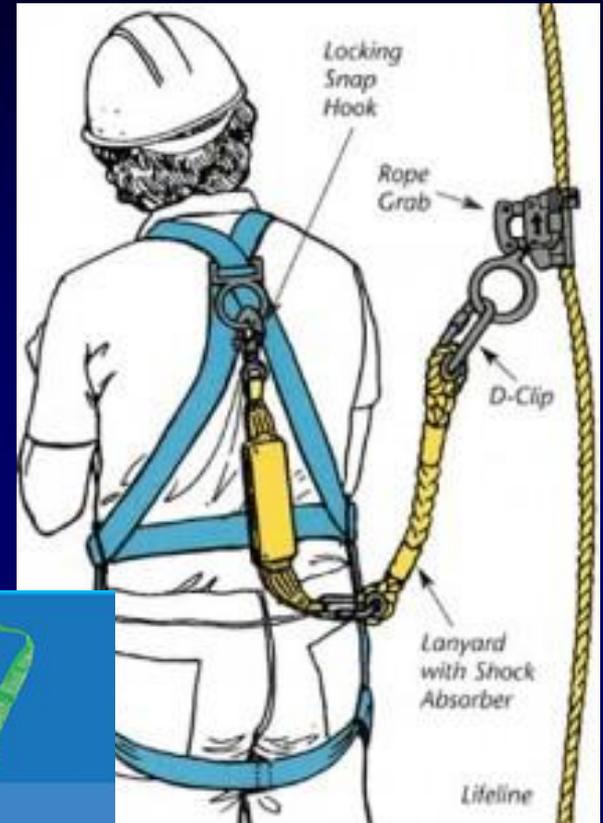
You must be trained how to properly use PFAS

PFAS include

A- Anchorage

B- Body support

C- Connectors



**A.**

## ANCHORAGE

A secure point of attachment (structure) for the fall arrest system. Commonly referred to as a tie-off point (ex. I-beam).



**B.**

## BODY SUPPORT

Full body harnesses provide a connection point on the worker for the personal fall arrest system.

**C.**

## CONNECTORS

Devices used to connect the worker's full body harness to the anchorage system (eg. shock absorbing lanyard, self retracting lifeline, etc.).

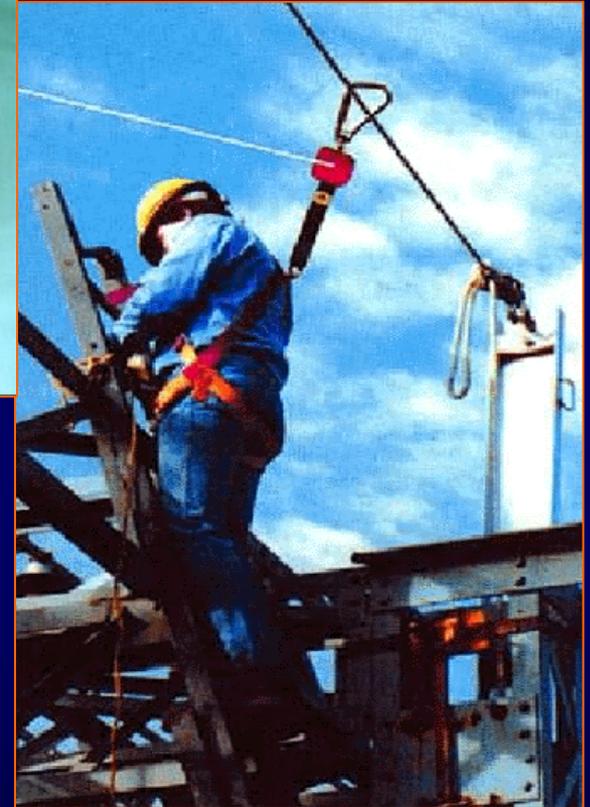


# Personal Fall Arrest System

Lanyard  
no free fall greater  
than 6'



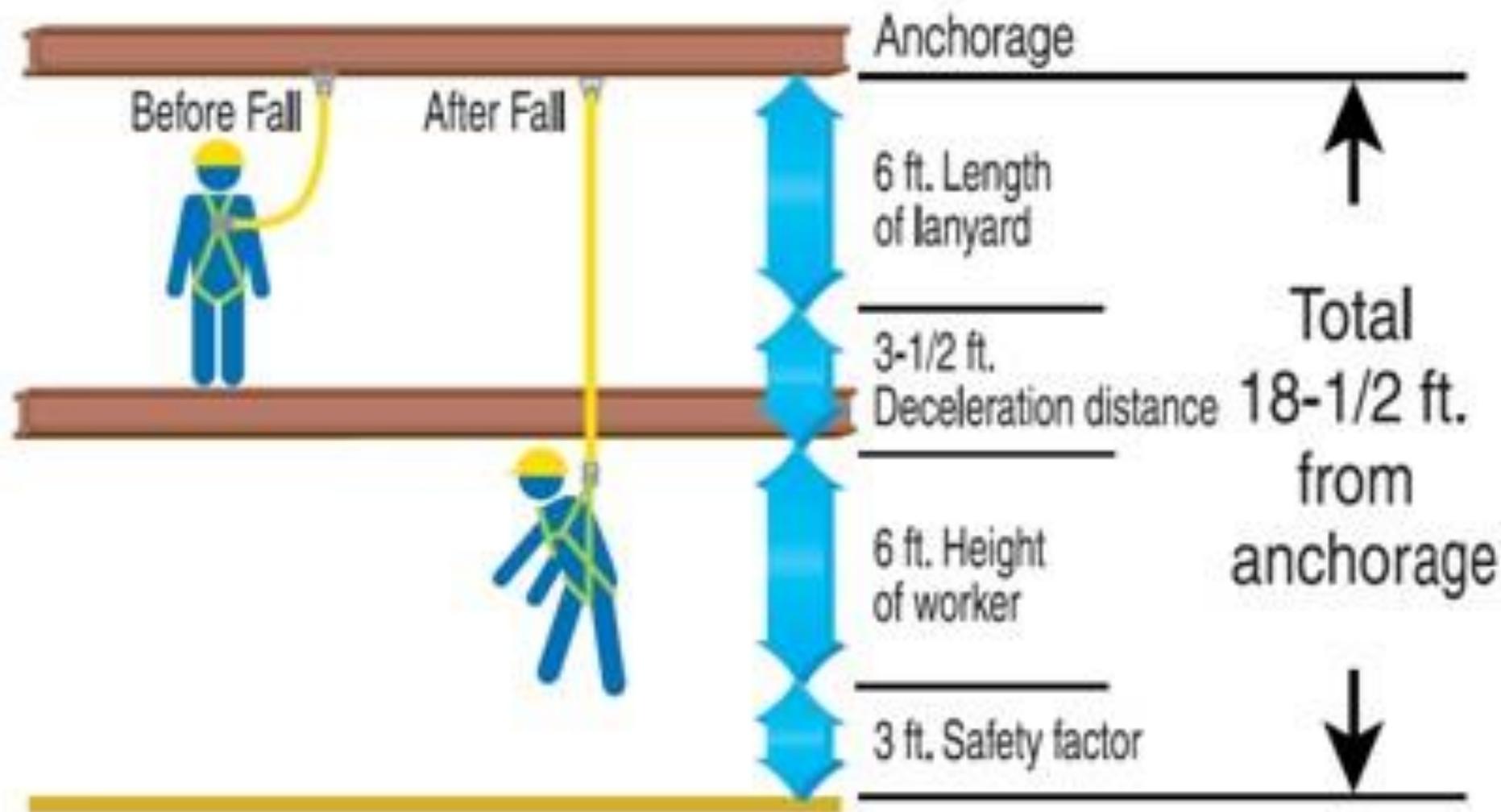
Body Support worn  
properly



Anchorage

Capable of supporting at least  
5,000lbs

# Calculating Your Potential Fall Distance



# Warning Line System

- Another option to protect the sides of roof work area or bridge decks
- Consists of rope, wire, or chain with flags 6 feet apart
- Not permitted in between line and roof edge



# When Fall Protection is Needed

- Walkways, runways, and ramps
- Unprotected sides and edges
- Hoist areas
- Holes
- Wall openings
- Excavations
- Formwork and reinforcing steel
- Precast concrete erection
- Leading edges
- Steep roofs and roofing work

# Walkways, Runways and Ramps



Guard ramps, runways, and other walkways with flagged wire rope or rails



# Unprotected Sides and Edges



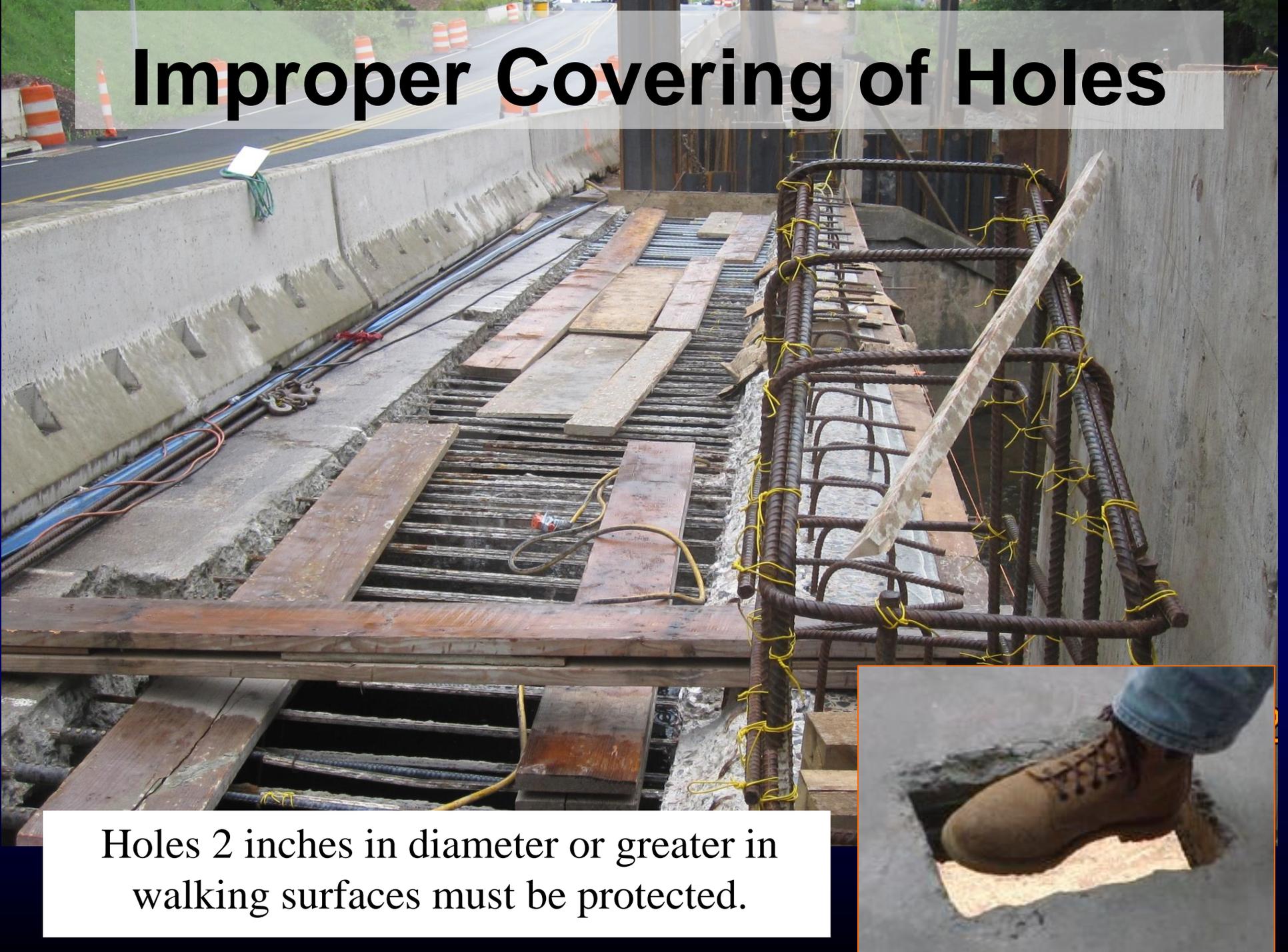
# Unprotected Edges





**Inadequate Protection of Edges**

# Improper Covering of Holes



Holes 2 inches in diameter or greater in walking surfaces must be protected.



# Improper Guarding of Holes

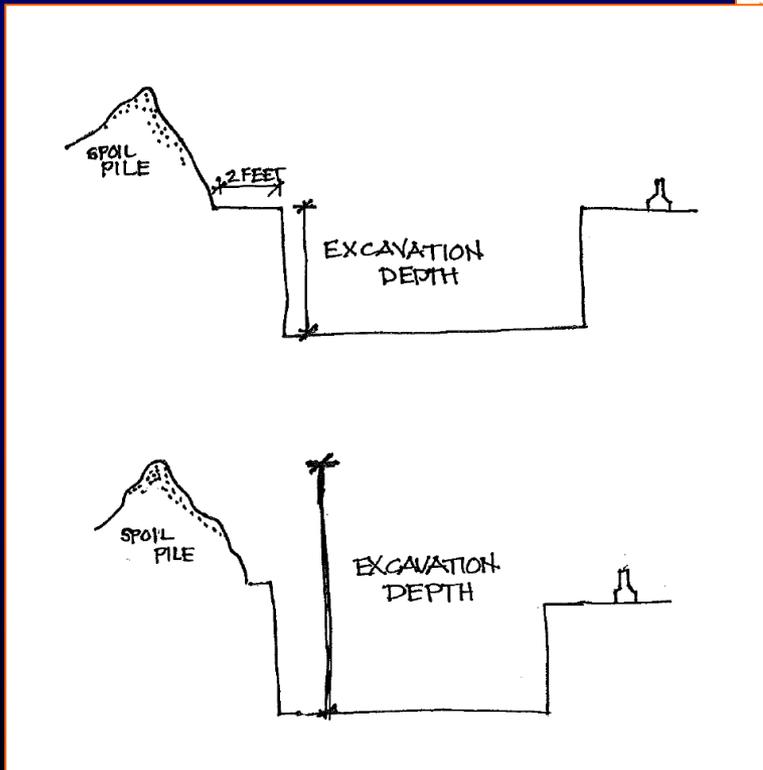


This rope used to guard the hole is inadequate

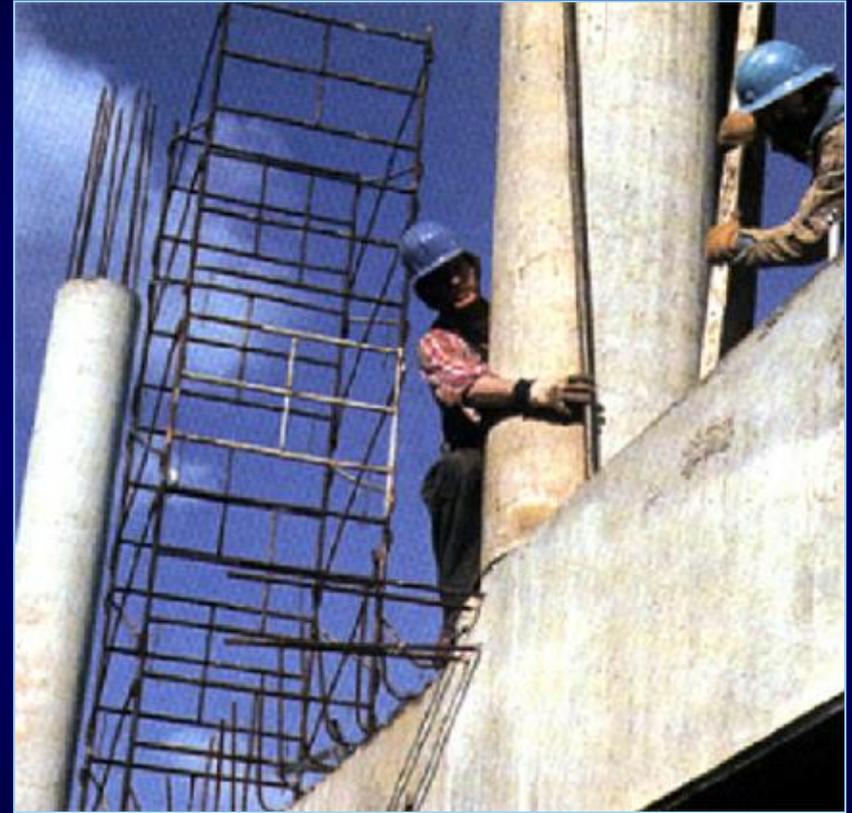


# Excavations

There isn't any protection against or warning of the excavation



# Formwork and Reinforcing Steel



Use a PFAS when working on formwork and rebar



# Leading Edge Work



# Good Work Practices

- Perform what you can at ground level
- Tether or restrain workers from edge
- Use conventional fall protection
- Designate and use safety monitors

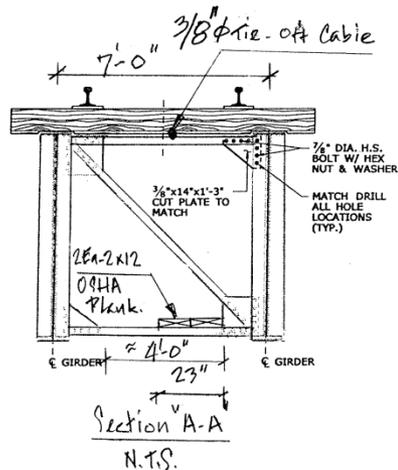
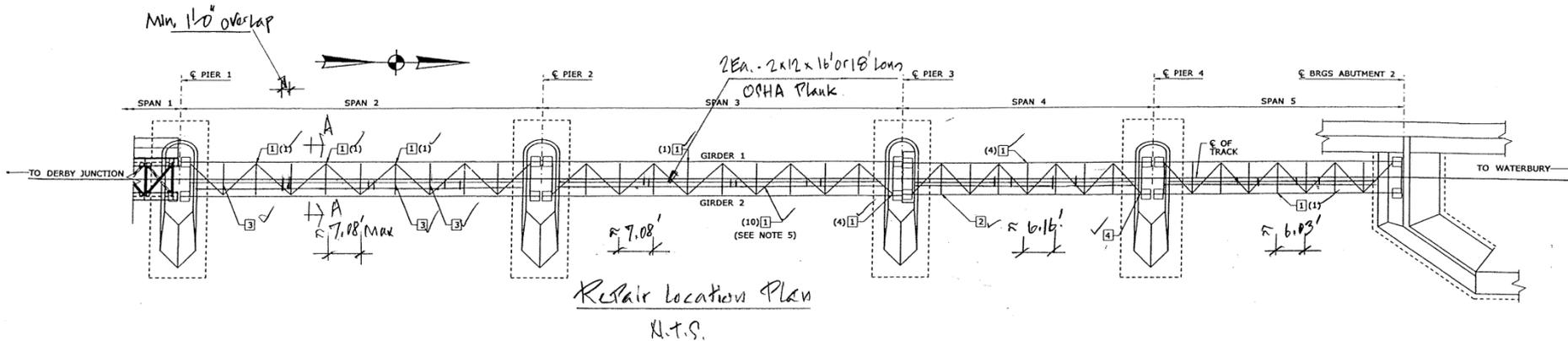


# Training

- All workers need to be trained
- Training must include:
  - Fall Hazards
  - Fall Protection Systems
  - Use of Systems



# Fall Protection System drawing submitted

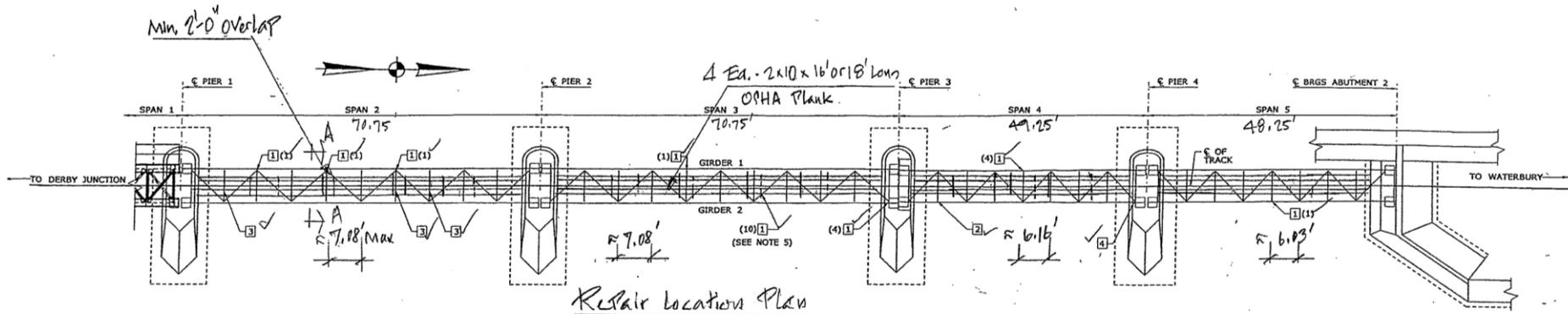


## Access to Structural Steel Repairs & Replace Missing Bolts/Rivets

1. Manlift positioned at Span 1 will be used to bring up OSHA planks to the Railroad Bridge at Span 2. Allowable load for the plank is 75 PSF for a maximum spacing of 9' (see attached technical data). Maximum spacing of the horizontal bracing on this bridge is approximately 7' on center.
2. Two of 2"x12" x 16' or 18' long OSHA planks, placed side by side on top of the bottom bracing, will be used as an access to work areas from Span 2 to Span 4. They will be tied down to the bottom bracing using No. 9 tie wire. At least 2' overlap for staggering is required.
3. Planks' location can be adjusted to accommodate work areas.
4. For fall protection, a 3/8" diameter tie off cable will be placed on top of the top horizontal bracing for workers to tie off during the operations.
5. Cables and planks will be removed off site once the operation is completed.

Obscured		
EAST GRANBY, CONNECTICUT		
CONNDOT PROJECT 304-008		
Town of Seymour, Connecticut		
Item 0603801A-Structural Steel Repairs Site No. 1		
Item 0603659A-Replace Removed/Missing Rivets & Bolts with HS Bolts		
Work Access Platforms		
Contractor: MIG	Engineer: Lochner	
Drawn by S.J.M.	Date: 7-14-12	Drwg. No. 239-WA

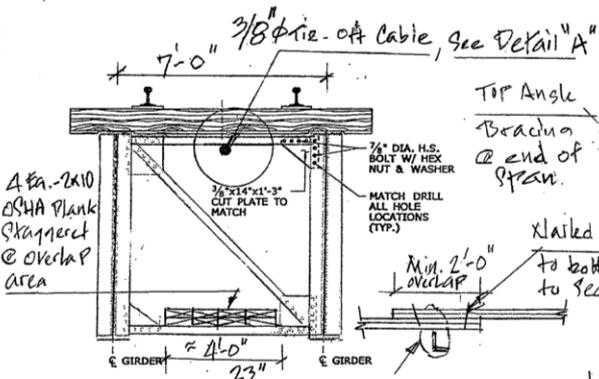
# Then we asked to see the engineered drawing



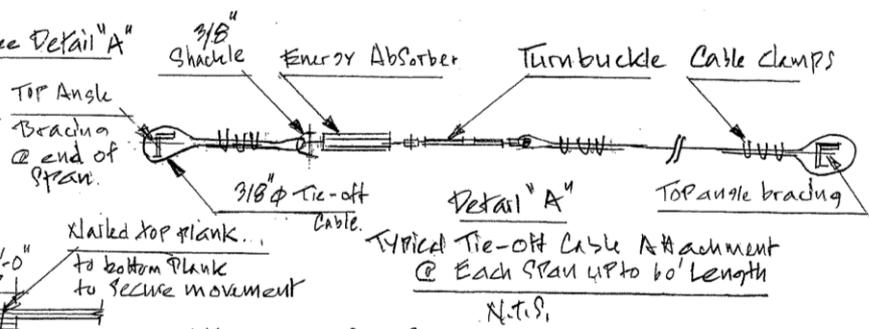
Repair Location Plan  
N.T.S.

**Access to Structural Steel Repairs & Replace Missing Bolts/Rivets**

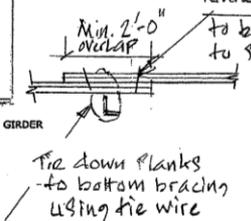
1. Manlift positioned at Span 1 will be used to bring up OSHA planks to the Railroad Bridge at Span 2. Allowable load for the plank is 50 PSF for a maximum spacing of 7' (see attached computations). Maximum spacing of the horizontal bracing on this bridge is approximately 7' on center besides the diagonal ones that are running between them.
2. Four of 2"x10" x 16' long OSHA planks, placed side by side on top of the bottom bracing, will be used as an access to work areas from Span 2 to Span 4. They will be tied down to the bottom bracing using tie wire. At least 2' overlap for staggering is required.
3. Nailed top plank to bottom plank where overlap occurred to secure plank from movement.
4. For fall protection, a 3/8" diameter tie off cable will be placed right under the top horizontal bracing for workers to tie off during the operations (see detail "A"). A maximum of 2 persons can be tied off to each 60' length of cable at one time.
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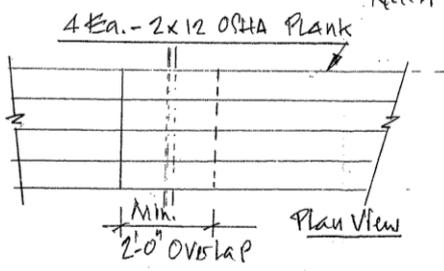
Section A-A  
N.T.S.



Typical Tie-off Cable Attachment @ Each Span up to 60' Length  
N.T.S.



Side View

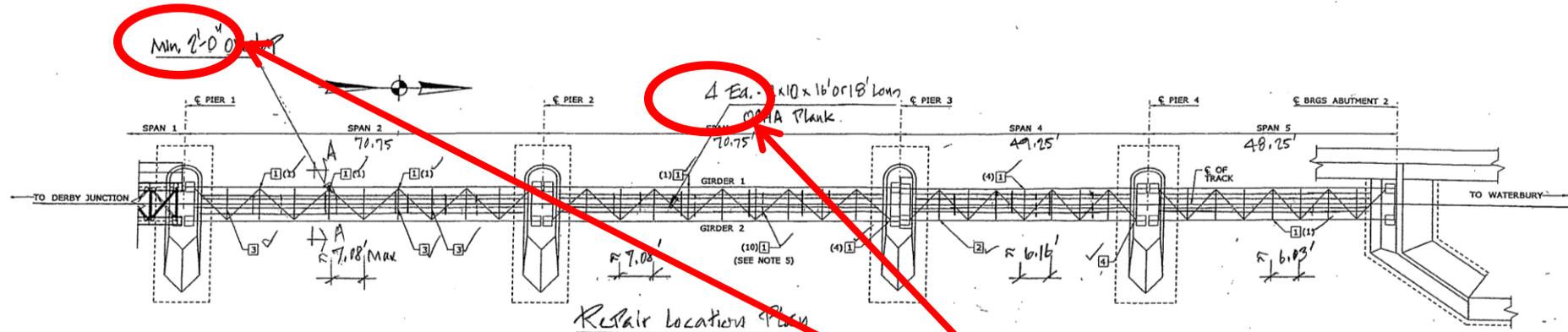


Plank Overlap Details  
N.T.S.



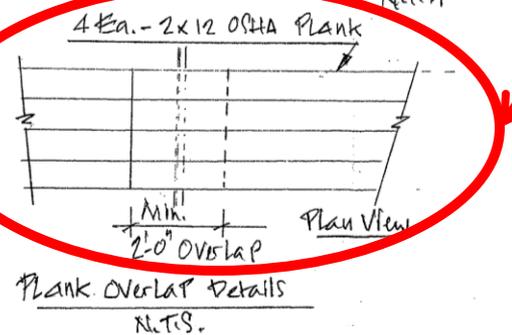
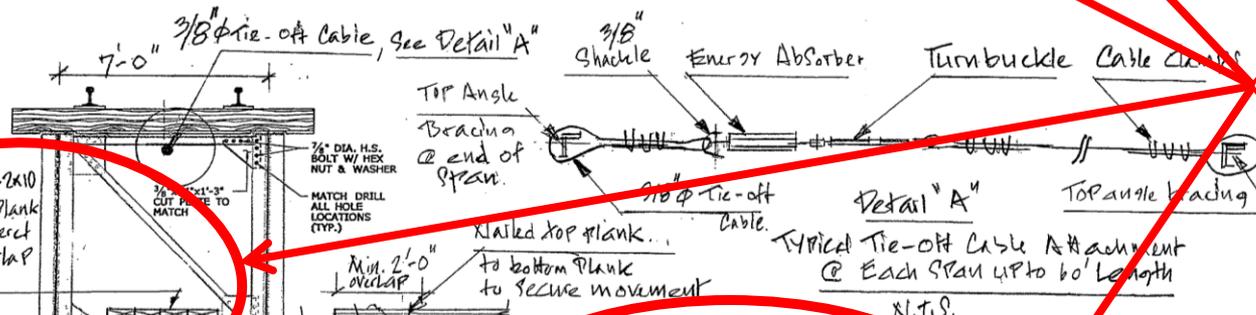
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Contractor: MIG		Engineer: Lochner
Drawn by: S.J.M.	Date: 8-7-12	Drwg. No. 239-WA1

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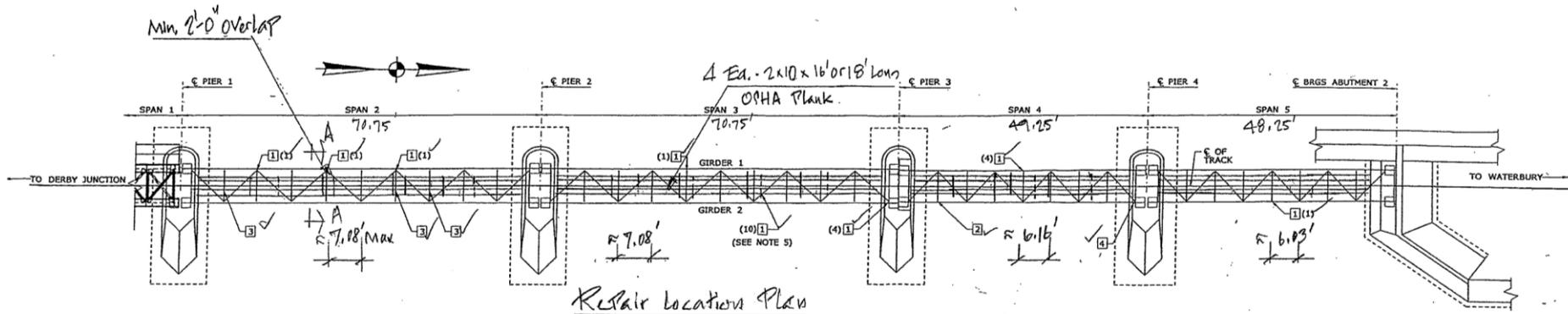
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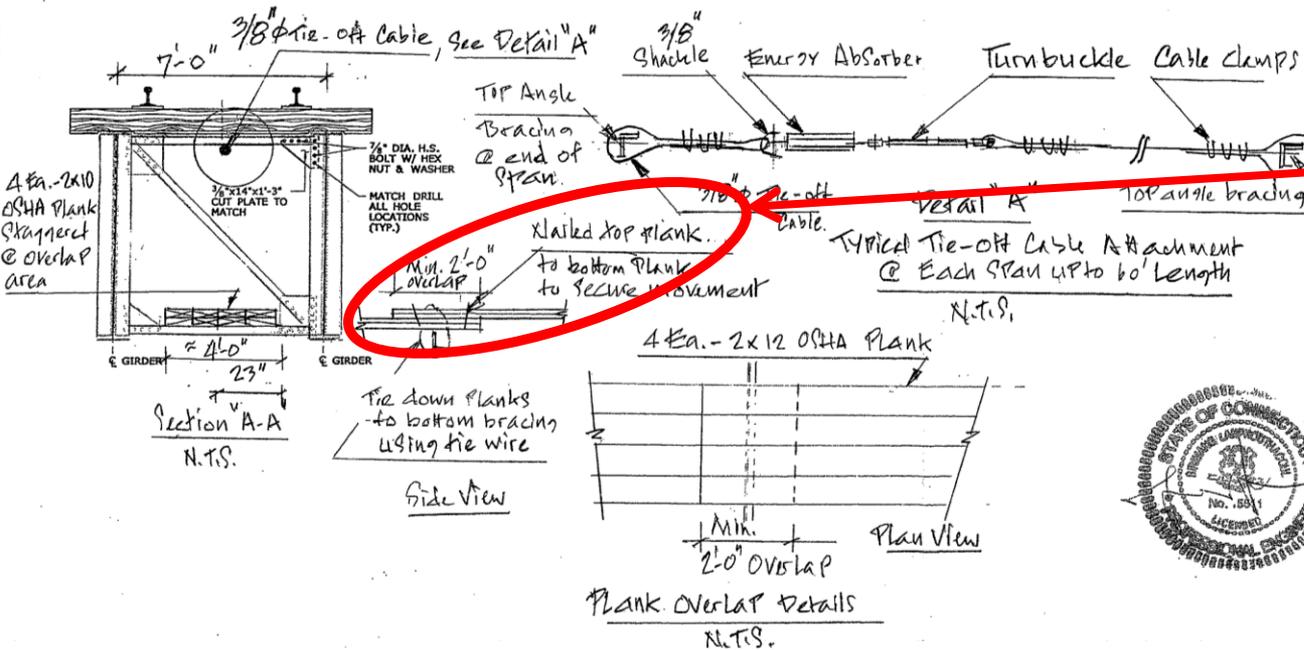
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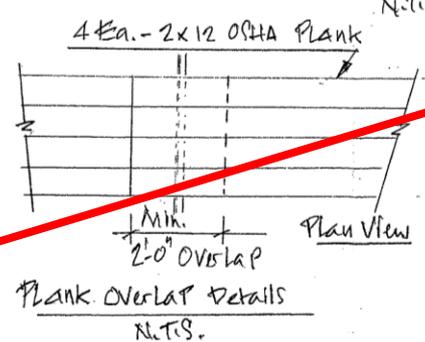
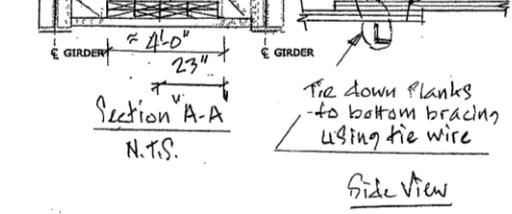
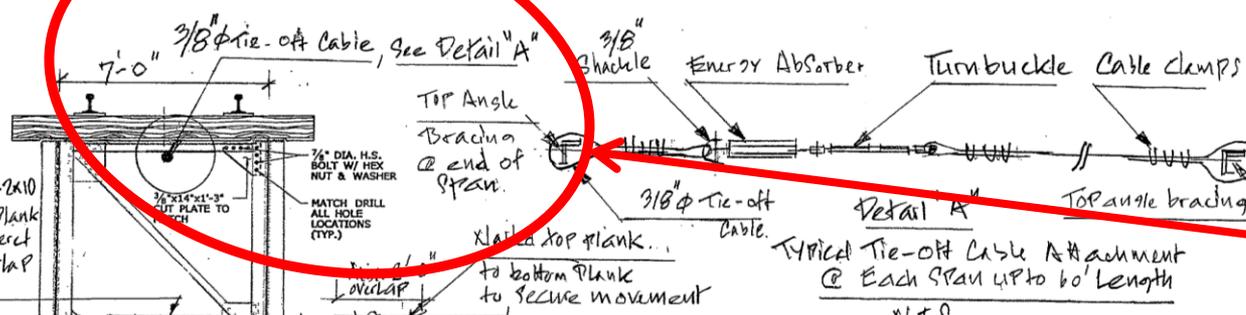
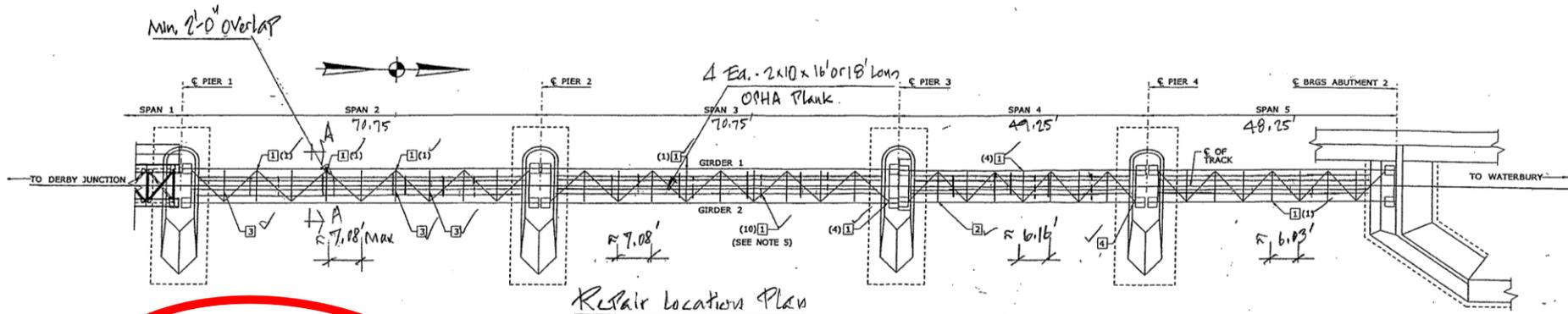
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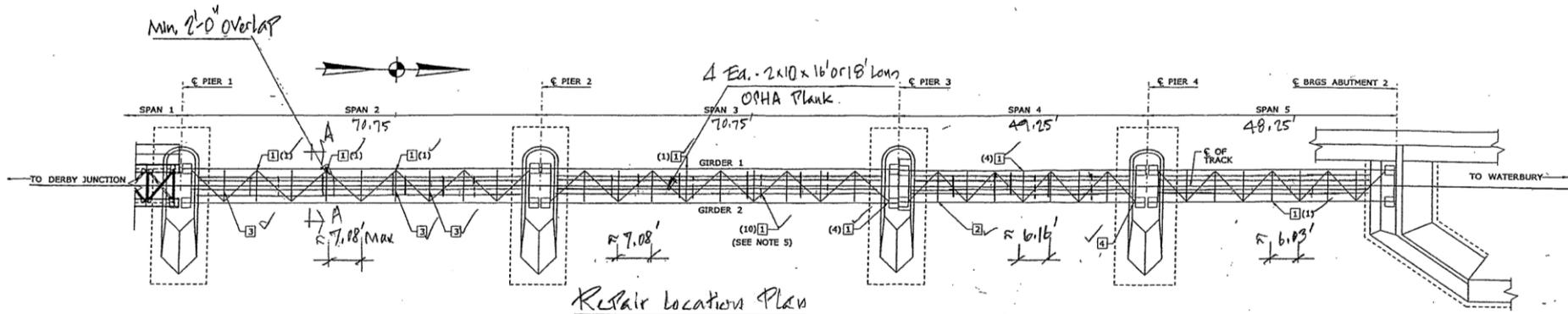
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**2 Person Max!**



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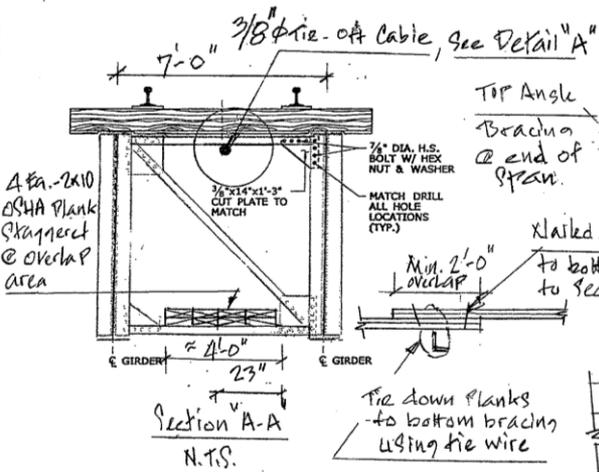
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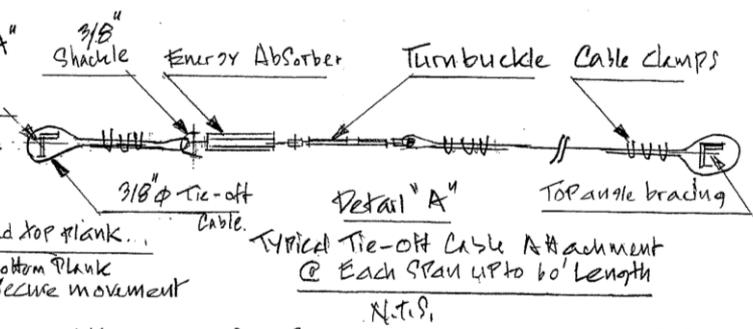
Repair Location Plan  
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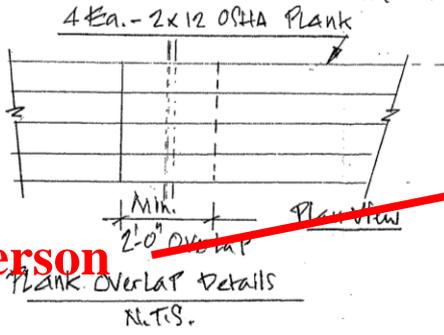
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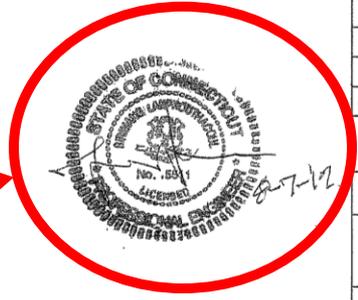
Side View



N.T.S.



N.T.S.



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**Designed by Qualified Person**



Obscured

## Computation Sheet

Page:

WPI

Obscured

Bridge No. 08272R

Designed by:

S.L.

Date:

8-7-12

Subject: over Naugatuck River, Seymour, CT

Checked by:

Item No. 603659A - Replace Removed/Missing Rivets

Date:

"Work Access Platform"

I) Check Platform Plankling &amp; brace Spacing

Use 2"x6" OSHA Plank, Actual Size =  $1\frac{1}{2} \times 9\frac{1}{4}$ "

$$I = \frac{bh^3}{12} = \frac{9.25(1.5)^3}{12} = 2.16 \text{ in}^4$$

$$S = \frac{bh^2}{6} = \frac{9.25(1.5)^2}{6} = 3.47 \text{ in}^3$$

Design Ind bs

$$F_b = 2,200 \times 1.25 \times 0.86 = 2,365 \text{ PSI}$$

$$E = 1,800,000 \times 0.97 = 1,746,000$$

$$H = 190 \times 1.25 \times 0.97$$

$$= 230 \text{ PSI}$$

Load used: 50 #/ft

• Check bending

$$l = 10.95 \sqrt{\frac{F_b}{W}} = 10.95 \sqrt{\frac{2365(3.47)}{50}} = 140.28"$$

• Check Deflection

$$\text{for } \Delta = \frac{l}{360}, l = 1.83 \sqrt[3]{\frac{EI}{W}} = 1.83 \sqrt[3]{\frac{1,746,000(2.16)}{50}} = 82.25" = 6.85'$$

2 span beam

7'6" spacing  
150k for walking.

• Check Shear

$$l = \frac{Hbh}{0.9W} + \frac{2h}{12} = \frac{230(9.25)(1.5)}{0.9(50)} + \frac{2(1.5)}{12} = 70.92 + 0.25 = 71.17'$$

Reference

Provided  
by WACO  
Steel Holdings

They also sent other details for the planks, the "Spider Line" Horizontal life line system along with this Computation Sheet.

# Summary

- For more than 6 feet, need protection
- Use fall protection on:
  - Walkways and ramps
  - Unprotected sides and edges
  - Holes
  - Excavations
- Protective measures include Personal Fall Arrest Systems, guardrails, safety nets, and covers
- Inspect all protection daily!



# Questions?



# **Harness and Lanyard**

**Formal Inspection**

**Competent Person Training**

# Occupational Safety and Health Administration Fed OSHA

Meraay Meraay – U.S. Department of Labor  
Occupational Safety and Health Administration  
Civil Engineer, Safety Engineer

Compliance Officer

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Hartford CT, 06103

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